

**DESCRIPTION**

The M51660L is a semiconductor integrated circuit for use in servo motor control in radio control applications.

Housed in a 14-pin molded plastic zig-zag inline package (ZIP), the M51660L contributes to the miniaturization of the set.

The built-in voltage regulating circuit, and the differential comparator used in the comparator circuit provide the M51660L with extremely stable power supply voltage fluctuation characteristics and temperature change characteristics.

**FEATURES**

- Small circuit current ..... 3.5mA typ.  
(When output is off)
- Excellent power supply and temperature stability
- Simple setting of dead band
- Includes protection circuit for continuous "H" level input

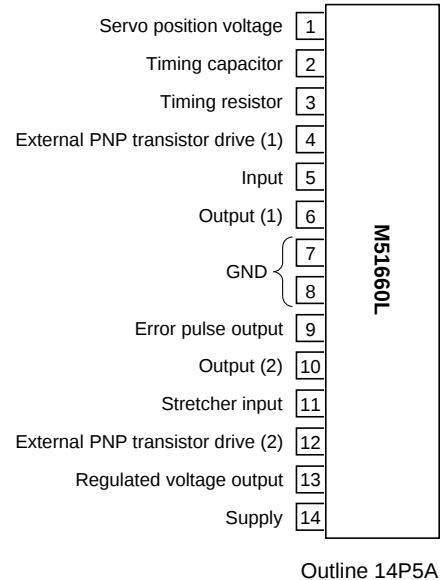
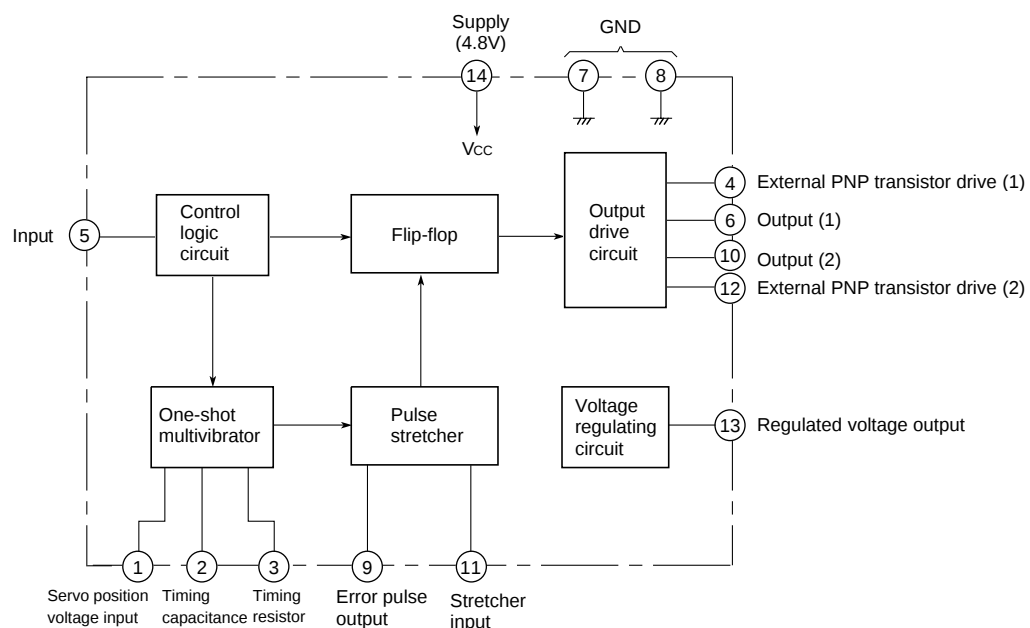
**APPLICATION**

Digital proportional system for radio control, and servo motor control circuit, etc.

**RECOMMENDED OPERATING CONDITIONS**

Supply voltage range ..... 3.5 – 7V

Rated supply voltage ..... 4.8V

**PIN CONFIGURATION (TOP VIEW)****BLOCK DIAGRAM**

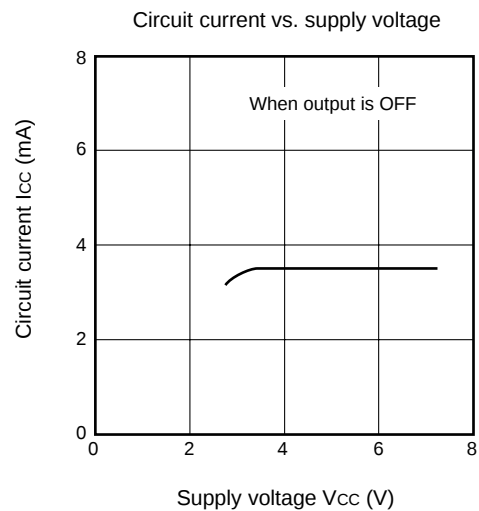
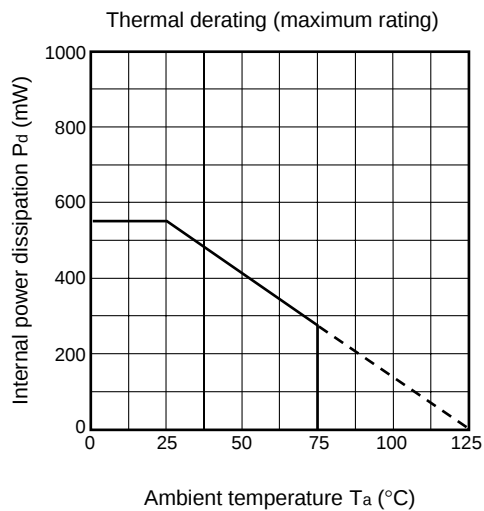
## SERVO MOTOR CONTROL FOR RADIO CONTROL

**ABSOLUTE MAXIMUM RATINGS** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

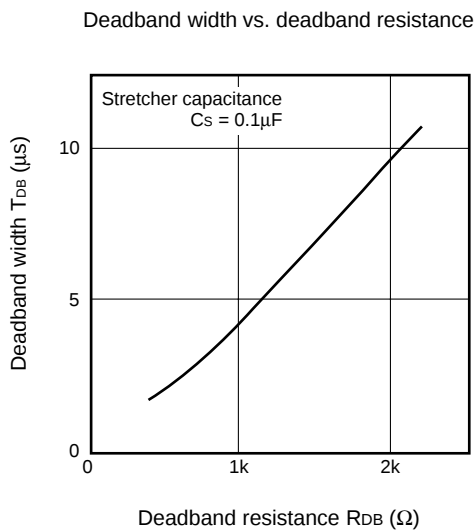
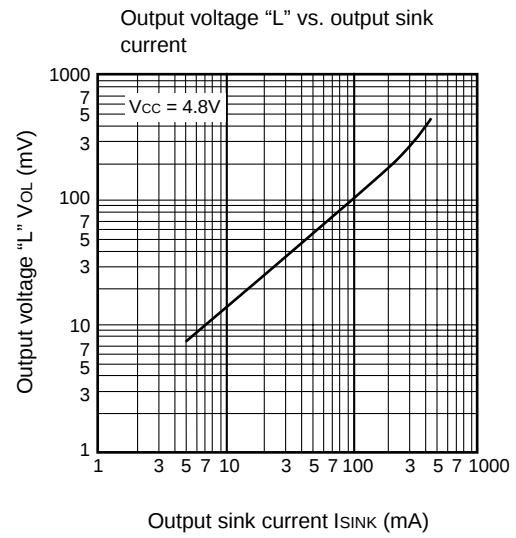
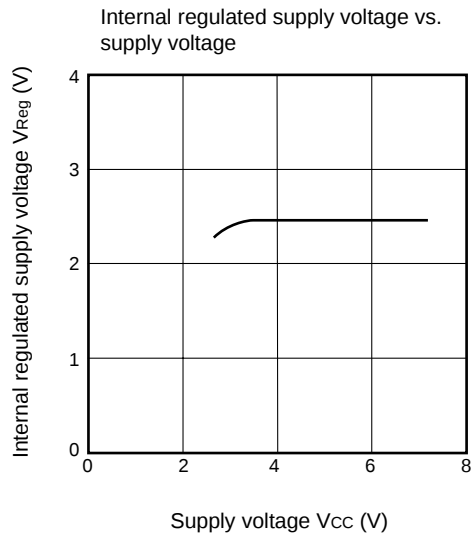
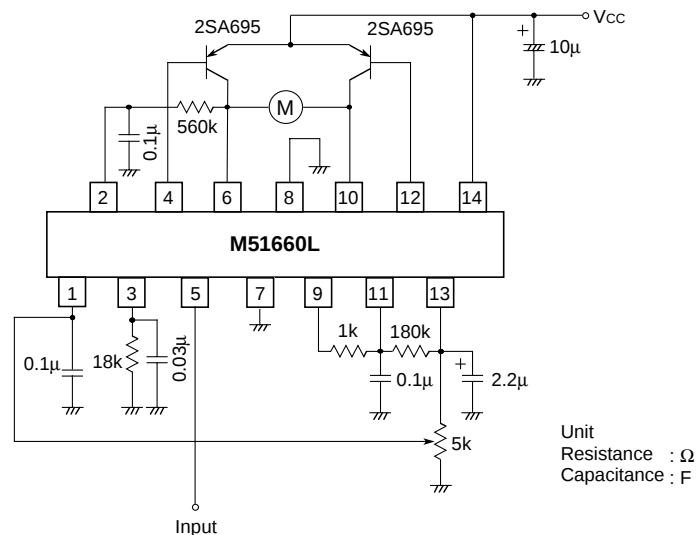
| Symbol                | Parameter                 | Conditions                  | Ratings    | Unit                 |
|-----------------------|---------------------------|-----------------------------|------------|----------------------|
| $V_{CC}$              | Supply voltage            |                             | 7.5        | V                    |
| $I_{O\text{ SINK}}$   | Output sink current       |                             | 500        | mA                   |
| $I_{O\text{ SOURCE}}$ | Output source current     |                             | 200        | mA                   |
| $P_d$                 | Power dissipation         |                             | 550        | mW                   |
| $K_\theta$            | Thermal derating range    | $T_a \geq 25^\circ\text{C}$ | 5.5        | mW/ $^\circ\text{C}$ |
| $T_{opr}$             | Operating temperature     |                             | -20 – +75  | $^\circ\text{C}$     |
| $T_{stg}$             | Storage temperature range |                             | -40 – +125 | $^\circ\text{C}$     |

**ELECTRICAL CHARACTERISTICS** ( $T_a = 25^\circ\text{C}$  and  $V_{CC} = 4.8\text{V}$ , unless otherwise noted)

| Symbol    | Parameter                                | Test conditions                               | Limits |      |      | Unit          |
|-----------|------------------------------------------|-----------------------------------------------|--------|------|------|---------------|
|           |                                          |                                               | Min.   | Typ. | Max. |               |
| $I_{CC}$  | Circuit current                          | When output is OFF                            |        | 3.5  | 5    | mA            |
|           |                                          | When output is ON                             |        | 20   |      |               |
| $V_{OL}$  | Output voltage "L"                       | $I_{O\text{ SINK}} = 100\text{mA}$            |        | 0.1  | 0.2  | V             |
|           |                                          | $I_{O\text{ SINK}} = 400\text{mA}$            |        | 0.4  | 0.7  |               |
| $V_{OH}$  | Output voltage "H"                       | $I_{O\text{ SOURCE}} = 100\text{mA}$          | 3.4    | 3.8  |      | V             |
| $I_{PNP}$ | External PNP transistor<br>Drive current |                                               | 30     |      |      | mA            |
| $V_{Reg}$ | Internal regulated supply voltage        |                                               | 2.3    | 2.45 | 2.6  | V             |
| $I_{Reg}$ | Internal regulated supply output current |                                               |        |      | 3.0  | mA            |
| $T_{DB}$  | Minimum dead band width                  | $R_{DB} = 510\Omega$ , $C_s = 0.1\mu\text{F}$ |        |      | 1.5  | $\mu\text{s}$ |

**TYPICAL CHARACTERISTICS** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

## SERVO MOTOR CONTROL FOR RADIO CONTROL

**APPLICATION EXAMPLE****Servo motor control circuit for radio-controlled**

**TECHNICAL APPLICATION NOTES****PIN DESCRIPTION****1. Servo Position Voltage Input Pin (Pin ①)**

Connect the potentiometer terminal for position detection that follows the output axis. Compare this voltage with the voltage of the triangular wave of pin ② and drive the motor. A capacitor of approximately 0.1 $\mu$ F should be connected for noise prevention.

**2. Timing Capacitor Pin (Pin ②)**

Connect a capacitor that will generate a triangular wave by constant current charging. A typical value is 0.1 $\mu$ F. Also connect a feedback resistor from the output here.

**3. Timing Resistor (Pin ③)**

Connect a resistor that will determine the value of the constant current of pin ②. A resistor of 18k $\Omega$  will yield a current of 1.0mA. A capacitor of approximately 0.03 $\mu$ F should be connected in parallel with the resistor to increase stability.

**4. External PNP Transistor Drive ① (Pin ④)**

Connect to the base of the external PNP transistor.

**5. Input Pin (Pin ⑤)**

Operate with a positive pulse of peak value 3V or greater.

**6. Output ① Pin (Pin ⑥)**

Connect a feedback resistor between this pin and pin ②.

**7. Ground (pins ⑦ and ⑧)****8. Error Pulse Output pin (Pin ⑨)**

Connect a resistor between this pin and pin ⑪. The dead band will change according to the value of this resistor.

**9. Output ② pin (Pin ⑩)**

This is the output ② pin.

**10. Stretcher Input Pin (Pin ⑪)**

Connect the capacitor and resistor of the pulse stretcher section.

**11. External PNP Transistor Drive ② (Pin ⑫)**

Connect to the base of the external PNP transistor.

**12. Regulated Voltage Output Pin (Pin ⑬)**

This is the output of the internal regulated supply voltage. Make connections from this pin to a potentiometer or pulse stretcher resistor. Connect a capacitor of approximately 2.2 $\mu$ F for stability.

**13. Supply Voltage (Pin ⑭)**

The supply voltage exhibits uniform characteristics from 3.5V to 7V. Connect a capacitor of approximately 10 $\mu$ F.

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